

ar In yet another embodiment, a pinning region with dopants of the first conductivity type at a fourth concentration density is within the surface region. Preferably, the pinning region is not covered by the dual purpose electrode. In one embodiment, the pinning region is aligned with the dual-purpose electrode, and extends along the collection region.

Please amend the paragraph starting on page 7, line 19 as follows:

an The shielding regions 42a, b shield the photoelectrons created in the substrate 24 from the potential of any oxide regions or detection regions 26. The electrostatic barrier formed at the interface between the shielding regions 42a, b and the substrate 24 prevents charges generated underneath the shielding regions 42a, b from diffusing into the junctions or other structures of the active pixel's additional electronics. There is no such electrostatic barrier present underneath the collection region 22, so it can consequently gather charges that are generated under the other electronic components. The collection junction of the preferred embodiment has a near 100% fill factor, which means that nearly the whole surface of the pixel that is exposed to light contributes to the pixel's detected signal. Therefore, the photodiode can have a small junction area and a small capacitance, while having a large collecting volume.

Please amend the paragraph starting on page 8, line 20 as follows:

af While complete charge transfer from the photodiode's collection region 22 of Fig. 2 to the detection region 26 of Fig. 2 is possible in theory, practically there are effects that may cause incomplete charge transfer: The complete transfer does not only depend on the voltage or voltage pulse applied to the gate 40, but also on the voltage present at the receiving node 26 in Fig. 2. Normally the  $V_{th}$  at the n doped side of the electrode is lower than at the p-doped side. This effect also is a reason that an amount of charge is retained in the n-region after transfer. As the amount of retained charge is rather constant, it can be neglected in normal sensor operation. This effect is also counteracted by increasing the voltage at 26 and/or making the p-doped part of the electrode shorter: the resulting electric field will facilitate the transfer of electrons.

#### IN THE CLAIMS

Please amend the claims as follows: